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The November Star-Shower in 1869. By A. S. Herschel, Esq.

The observations of the appearances of the November Meteors, during the last few years of their great returns, present certain irregularities, which it is either possible for physical astronomy to explain, by calculating the perturbations exercised upon the course of the stream by the attraction of the planets, or which may arise from the peculiar configuration of the meteoric current. Supposing the main body of the November meteors, which, in the years 1866 and 1867, made its appearance, successively, in Europe and America, to be an individual portion of the stream, subject during the years 1868 and 1869 to a continuance of the same perturbations which made its return in the year 1867 take place two hours later than the time when (from its occurrence in 1866) it was expected to appear; supposing also that the density of the current, at the point where the Earth will traverse it in the present month, is not yet exhausted,—the time of reappearance of the main-stream of meteors, this year, in England will be almost exactly the same,—between 1^h and 2^h A.M. on the morning of the 14th instant,—as that of its greatest intensity in 1866. A watch for meteors continued from the time of *Leo's* rising on Saturday night the 13th, until sunrise on Sunday morning next, the 14th instant, will probably be rewarded by a view of the return of the central portion of the meteor-stream in Great Britain, although, doubtless, owing to the waning character of the phenomenon, with diminished intensity, yet under the same favourable conditions as those in which it was observed in England in 1866.

Observations at other times and places than those of the great returns of the star-shower in 1866 and 1867 appear to indicate the existence of two meteoric currents bordering upon the main-stream, but separated from it by blank spaces almost entirely devoid of meteors, and forming lateral outliers of the stream, near to which they appear to move in parallel, and closely adjacent orbits. The passage of the Earth through the first of these outlying streams occurs about twelve hours earlier, and its passage through the last about twelve or fifteen hours later, than its appulse with the main or central current. For a knowledge of this peculiar conformation of the November meteoric stream, as exhibited in its occurrences of the last few years, I am indebted to a very important observation communicated to me at the beginning of the present year by Mr. Benjamin V. Marsh, of Philadelphia, U.S., of the occurrence of a remarkably brilliant meteoric shower in China, on the morning of the 15th of November, 1867, *about twelve hours later*, *in absolute time*, than the beginning and end of the great display seen *in the same year* in the United States.* The times of the previously recorded star-showers, and of that conspicuously seen in America last year,

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are thus graphically exhibited by Mr. Marsh in a single diagram (No. 1), which shows the dates and hours of their occurrence, in Philadelphia time, reduced to the common epoch of the year 1868.

Diagram No. 1.

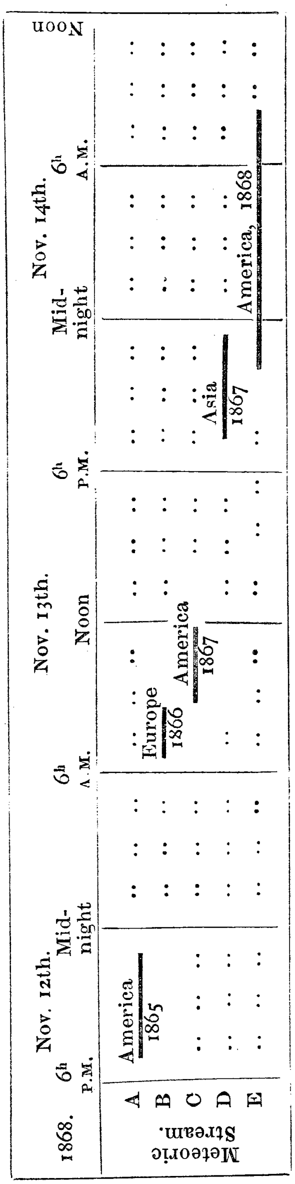
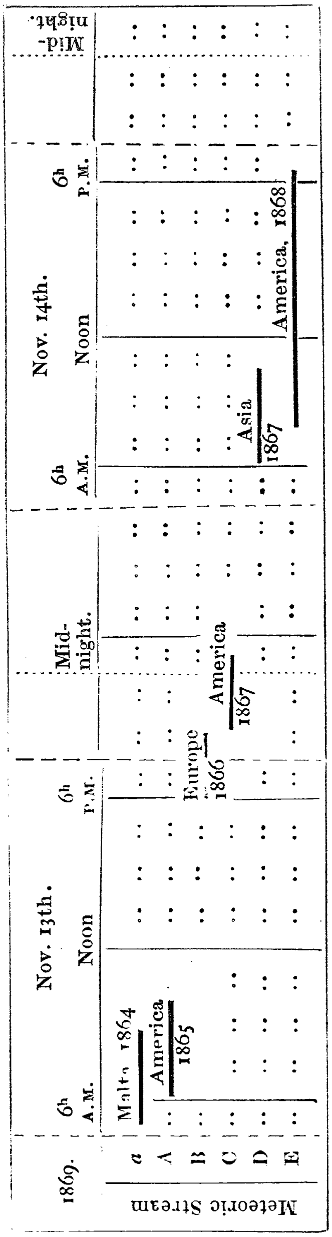


Diagram No. 2.



Place, Year, and Local Time of Maximum.						Philadelphia Time of Ditto.				
				h	m				h	m
Shower A, Philadelphia,	1865,	Nov.	13,	3	0 A.M.	1865,	Nov.	13,	3	0 A.M.
B, London,	1866,	,,	14,	1	15 ,,	1866,	,,	13,	3	0 P.M.
C, Philadelphia,	1867,	,,	14,	4	30 ,,	1867,	,,	14,	4	30 A.M.
D, Shanghai,	67,	,,	15,	4	30 ,,	67,	,,	14,	3	30 P.M.
E, Philadelphia,	1868,	,,	14,	3	0 ,,	1868,	,,	14,	3	0 A.M.

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Philadelphia should have crossed those streams in 1868 (as shown in the diagram), at the following times:—

	Meteoric Stream and its Duration. (Philadelphia Time).			Maximum. (Philadelphia Time).	
		h m	h m		h m
A,	1868, Nov. 12,	7 0 P.M. to	11 0 P.M.	1868, Nov. 12,	9 0 P.M.
B,	,, ,, 13,	7 0 A.M. ,,	9 0 A.M.	,, ,, 13,	8 0 A.M.
C,	,, ,, 13,	9 0 ,, ,,	12 0 Noon	,, ,, 13,	10 30 ,,
D,	,, ,, 13,	7 30 P.M. ,,	11 30 P.M.	,, ,, 13,	9 30 P.M.
E,	,, ,, 13,	10 0 P.M. ,,	8 0 A.M. (Nov. 14)	,, ,, 14,	3 0 A.M.

A simple inspection of the diagram will suffice to show that the great shower of meteors seen last year in Europe and America corresponds more nearly, in the time of its appearance, *to the Asiatic star-shower*, than to the American apparition of the meteors in 1867; while the latter appears to coincide most nearly with a reappearance of the main body of the meteors observed in Europe in the previous year.

By adding five hours to the times in the last of the foregoing tables, for the longitude of Philadelphia west from Greenwich, and six hours more for the fraction of a day in one tropical year elapsed since the epoch for which it was prepared, the following diagram (No. 2, p. 7) is easily drawn from that obtained by Mr. Marsh, to aid observers of the shower in England in the present year:—

The shower (*a*) is added to the list from an observation recorded in the "British Association Report for 1865," p. 122; and the times when Greenwich should cross the several streams this year are as follows:—

	Meteoric Stream and its Duration. (Greenwich Mean Time).			Maximum. (Greenwich Mean Time).	
		h m	h m		h m
a,	1869, Nov. 13,	5 0 A.M. to	9 0 A.M.	1869, Nov. 13,	7 0 A.M.
A,	,, ,, 13,	6 0 ,, ,,	10 0 ,,	,, ,, 13,	8 0 ,,
B,	,, ,, 13,	6 0 P.M. ,,	8 0 P.M.	,, ,, 13,	7 0 P.M.
C,	,, ,, 13,	8 0 ,, ,,	11 0 ,,	,, ,, 13,	9 30 ,,
D,	,, ,, 14,	6 30 A.M. ,,	10 30 A.M.	,, ,, 14,	8 30 A.M.
E,	,, ,, 14,	9 0 A.M. ,,	7 0 P.M.	,, ,, 14,	2 0 P.M.

The vertical broken lines in the figure indicate the duration of darkness, and the vertical dotted lines the time when the radiant-point in *Leo* rises above the horizon at Greenwich. Should the main body of the meteors reappear in the present year, without having undergone any perturbations since November 1867, a few meteors of their display will be visible at Greenwich in the last hour preceding midnight on Saturday the 13th instant. If, on the other hand, the same gradual advance of the shower continues, which is perceived on the diagrams in all the three branches of which the stream consists, the reappearance of

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the central shower will commence at Greenwich on Saturday at midnight, and continue until Sunday morning, at 3^h A.M.; the circumstances in this case being as favourable for its complete observation as they were on the night of the 13th–14th of November, 1866.

Although it does not appear that the outlying currents of the group are this year favourably situated for observation in Great Britain, yet the observation of a frequency of meteors towards daybreak on the morning of the 13th (Saturday) and of an unusual number of meteors after 11 o'clock P.M. on the night of the 14th (Sunday) would confirm the probable existence of two companion streams of the central meteor-current, and would afford material data for determining the limits of their extent.

The large meteor which was very generally seen in the south of England at about $6^h\ 50^m$ P.M. on the evening of the 6th instant, was also seen at Hawkhurst, in Kent, and the position of the luminous streak which it left visible, standing, apparently, quite perpendicularly over the point where the meteor disappeared, was noted exactly by the stars. It extended from *Vega Lyræ* to a point two or three degrees above and to the right of the star *μ Herculis*, where the meteor burst into fragments of white blue and orange colours, and left a small cloud of light at that spot, like a nebula, which remained visible for several minutes. The observer particularly noticed the extreme rapidity of the meteor's flight, and its perpendicular direction towards the Earth; but no sound of a report was heard, although he listened attentively for some minutes. The direction of the meteor was nearly due west, and its point of disappearance was about 40° from the horizon.

Note on the Sun's Motion in Space and on the relative Distances of the Fixed Stars of various Magnitudes. By Richard A. Proctor, B.A.

Having recently had occasion to examine Mr. Main's Table of the Proper Motions of 1167 Stars, and the conclusions with reference to the Sun's motion deduced from that table by a method devised by the Astronomer Royal, and carried out at his request by Mr. Dunkin, I have been led to notice certain facts which seem to me to be not without significance.

In the first place, I would call attention to the table drawn up by Mr. Dunkin, in which the sums of the squares of the stars' proper motions are compared with the corresponding sums when the proper motion of each star has been corrected for the Sun's calculated motion in space. Mr. Dunkin comments on the singular smallness of the correction thus introduced. And this view seems abundantly verified by the table, which runs as follows, the divisions 1 to 7 corresponding to Struve's arrangement of the stars in order of magnitude:—